

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

1-23 (Canceled)

24. (Previously presented): An apparatus, comprising:

a substrate;

a waveguide embedded within said substrate, wherein an optical signal may propagate through said waveguide;

at least two or more light sources disposed on a first side of said substrate along a length of said waveguide to emit light into said waveguide in a direction substantially transverse to a direction of propagation of the optical signal, the light emitted from said at least two or more light sources to pump the optical signal;

a reflector disposed on a second side of said substrate to reflect at least a portion of light emitted from said at least two or more light sources into said waveguide, the reflected light to pump the optical signal.

25. (Previously presented): An apparatus as claimed in claim 24, wherein said waveguide is doped with erbium.

26. (Previously presented): An apparatus as claimed in claim 24, wherein the light source is a vertical cavity emitting laser.

27. (Previously presented): An apparatus as claimed in claim 24, wherein light emitted from said light source has a wavelength in the range of 980 nanometers to 1480 nanometers.

28. (Previously presented): An apparatus, comprising:

a semiconductor substrate;

a waveguide embedded within said semiconductor substrate through which an optical signal may propagate; and

at least two or more semiconductor light sources disposed on a first side of said substrate along a length of said waveguide to emit light into said waveguide in a direction substantially transverse to a direction of propagation of the optical signal, the light emitted from said at least two or more semiconductor light sources to pump the optical signal.

29. (Previously presented): An apparatus as claimed in claim 28, wherein said waveguide is doped with erbium.

30. (Previously presented): An apparatus as claimed in claim 29, wherein the light source is a vertical cavity emitting laser.

31. (Previously presented): An apparatus as claimed in claim 28, wherein light emitted from said light source has a wavelength in the range of 980 nanometers to 1480 nanometers.

32. (Previously presented): An apparatus as claimed in claim 28, further comprising a reflector disposed on a second side of said semiconductor substrate to reflect at least a portion of the light emitted from said at least two or more semiconductor light sources

into said waveguide, wherein said reflector has a refractive index that is different than a refractive index of said semiconductor substrate.

33. (Previously presented): An apparatus, comprising

a semiconductor substrate;

a waveguide embedded within said semiconductor substrate through which an optical signal may propagate; and

at least two or more semiconductor light sources disposed on a first side of said substrate along a length of the waveguide to emit light into said waveguide in a direction substantially transverse to a direction of propagation of the optical signal, the light emitted from said at least two or more semiconductor light sources to pump the optical signal, wherein at least two of said at least two or more semiconductor light sources are disposed within a single light source substrate.

34. (Previously presented): An apparatus as claimed in claim 33, wherein said waveguide is doped with erbium.

35. (Previously presented): An apparatus as claimed in claim 33, wherein at least a portion of the light emitted from said light source is perpendicular to a direction of propagation of the optical signal through the waveguide.

36. (Previously presented): An apparatus as claimed in claim 33, wherein the light source is a vertical cavity emitting laser.

37. (Previously Presented): An apparatus as claimed in claim 33, wherein light emitted from said light source has a wavelength in the range of 980 nanometers to 1480 nanometers.

38. (Previously presented): An apparatus as claimed in claim 33, further comprising a reflector disposed on a second side of said semiconductor substrate to reflect at least a portion of the light emitted from said at least two or more semiconductor light sources into the waveguide, wherein said reflector has a refractive index that is different than a refractive index of said semiconductor substrate.

39. (Previously presented): An apparatus, comprising:

a semiconductor substrate;

a waveguide embedded within said semiconductor substrate through which an optical signal may propagate, said waveguide being doped with erbium; and

at least two or more lasers disposed on a first side of said substrate along a length of the waveguide to emit light into the waveguide in a direction substantially transverse to a direction of propagation of the optical signal through said waveguide, the light emitted from said at least two or more lasers to pump the optical signal, wherein at least two of said at least two or more lasers are disposed within a single laser substrate.

40. (Previously presented): An apparatus as claimed in claim 39, wherein at least one of said two or more lasers is a vertical cavity emitting laser.

41. (Previously presented): An apparatus as claimed in claim 39, wherein light emitted from said two or more lasers has a wavelength in the range of 980 nanometers to 1480 nanometers.

42. (Previously presented): An apparatus as claimed in claim 39, further comprising a reflector disposed on a second side of said semiconductor substrate to reflect at least a portion of the light emitted from said at least two or more lasers into the waveguide,

wherein said reflector has a refractive index that is different than a refractive index of said semiconductor substrate.

43. (Previously presented): An apparatus as claimed in claim 24, wherein at least a portion of the light emitted from said light source is perpendicular to a direction of propagation of the optical signal through the waveguide.

44. (Previously presented): An apparatus as claimed in claim 28, wherein at least a portion of the light emitted from said at least two or more semiconductor light source is perpendicular to a direction of propagation of the optical signal through the waveguide.

45. (Previously presented): An apparatus as claimed in claim 39, wherein at least a portion of the light emitted from said lasers source is perpendicular to a direction of propagation of the optical signal through the waveguide.

46. (New): An apparatus as claimed in claim 24, wherein the substantially transverse direction is transverse.

47. (New): An apparatus as claimed in claim 24, wherein the at least two or more light sources along the length of the waveguide comprises at least five light sources spaced apart according to a lithographically-defined spacing along the length of the waveguide.

48. (New): An apparatus as claimed in claim 24, wherein the at least two or more light sources along the length of the waveguide are directly above the waveguide and provide light vertically down into the waveguide.

49. (New): An apparatus as claimed in claim 24, wherein the at least two or more light sources along the length of the waveguide are of a common substrate that is bonded to a surface of the substrate having the embedded waveguide.

50. (New): An apparatus as claimed in claim 28, wherein the substantially transverse direction is transverse.

51. (New): An apparatus as claimed in claim 28, wherein the at least two or more light sources along the length of the waveguide comprises at least five light sources spaced apart according to a lithographically-defined spacing along the length of the waveguide.

52. (New): An apparatus as claimed in claim 28, wherein the at least two or more light sources along the length of the waveguide are directly above the waveguide and provide light vertically down into the waveguide.

53. (New): An apparatus as claimed in claim 33, wherein the substantially transverse direction is transverse.